

Computational laboratory astrophysics to enable transport modeling of protons and hydrogen in stellar winds, the ISM, and other astrophysical environments - NAU

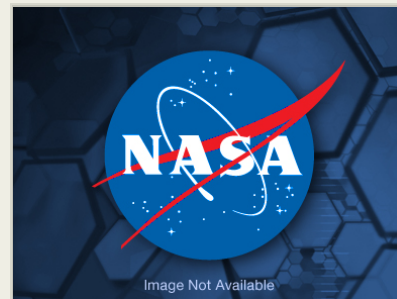
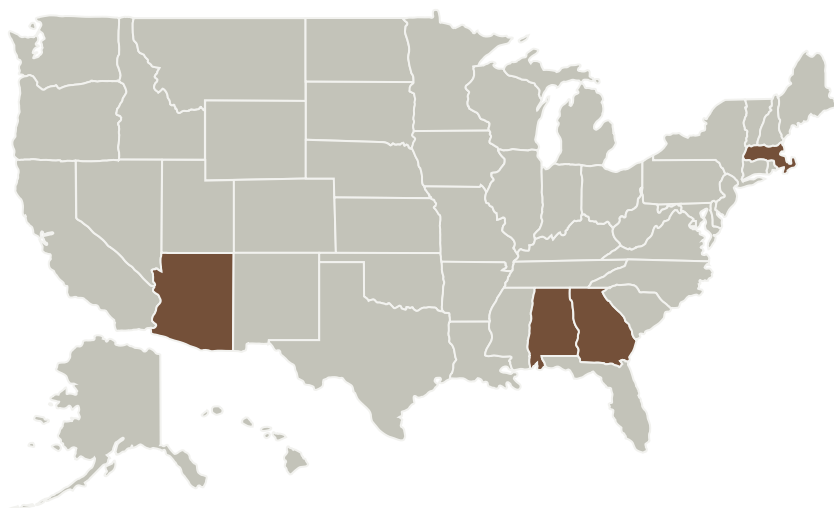
Completed Technology Project (2018 - 2020)



Project Introduction

As recognized prominently by the APRA program, interpretation of NASA astrophysical mission observations requires significant products of laboratory astrophysics, for example, spectral lines and transition probabilities, electron-, proton-, or heavy-particle collision data. Availability of these data underpin robust and validated models of astrophysical emissions and absorptions, energy, momentum, and particle transport, dynamics, and reactions. Therefore, measured or computationally derived, analyzed, and readily available laboratory astrophysics data significantly enhances the scientific return on NASA missions such as HST, Spitzer, and JWST. In the present work a comprehensive set of data will be developed for the ubiquitous proton-hydrogen and hydrogen-hydrogen collisions in astrophysical environments including ISM shocks, supernova remnants and bubbles, HI clouds, young stellar objects, and winds within stellar spheres, covering the necessary wide range of energy- and charge-changing channels, collision energies, and most relevant scattering parameters. In addition, building on preliminary work, a transport and reaction simulation will be developed incorporating the elastic and inelastic collision data collected and produced. The work will build upon significant previous efforts of the principal investigators and collaborators, will result in a comprehensive data set required for modeling these environments and interpreting NASA astrophysical mission observations, and will benefit from feedback from collaborators who are active users of the work proposed.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Northern Arizona University	Lead Organization	Academia Hispanic Serving Institutions (HSI)	Flagstaff, Arizona
Smithsonian Astrophysical Observatory(SAO)	Supporting Organization	US Government	Cambridge, Massachusetts
The University of Alabama	Supporting Organization	Academia	Tuscaloosa, Alabama
University of Georgia	Supporting Organization	Academia	Athens, Georgia

Primary U.S. Work Locations

Alabama	Arizona
Georgia	Massachusetts

Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Lead Organization:

Northern Arizona University

Responsible Program:

Astrophysics Research and Analysis

Project Management

Program Director:

Michael A Garcia

Program Manager:

Dominic J Benford

Principal Investigator:

David R Schultz

Co-Investigators:

Phillip C Stancil
Joel Fritzler
John C Raymond
Gary P Zank

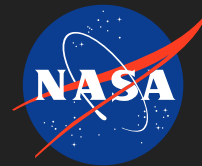
Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing

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Technology Areas (cont.)

- └ TX11.4 Information Processing
- └ TX11.4.4 Collaborative Science and Engineering

Target Destination

Outside the Solar System